POLLINATION OF *HOYA AUSTRALIS* (ASCLEPIADACEAE) BY *OCYBADISTES WALKERI SOTHIS* (LEPIDOPTERA: HESPERIIDAE)

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Abstract

Plants of *Hoya australis* R. Br. ex Traill (Asclepiadaceae) cultivated at Indooroopilly, Brisbane were pollinated by *Ocybadistes walkeri sothis* Waterhouse (Lepidoptera: Hesperiidae) over several months. A pollination efficiency (pollinaria inserted to pollinaria removed) of 70% was recorded.

Introduction

In the strictly entomophilous plant-family Asclepiadaceae, pollination is effected by the removal and insertion of pollinaria by insect vectors (Wyatt 1976), or rarely by *in situ* pollen germination (Kunze 1991). These pollinaria consist of three main components, the corpusculum, caudicles and pollinia (Bookman 1981) (Fig. 1H). Hymenoptera (Wanntorp 1974, Pant *et al.* 1984, Morse and Fritz 1983, Wyatt and Shannon 1986, Willmer 1988), Diptera (Agnew 1976, Sabrosky 1987), Lepidoptera (Willson and Bertin 1979, Morse and Fritz 1983) and Coleoptera (Pant *et al.* 1984) have been found to be effective cross-pollination agents of a variety of asclepiads. Insects are attracted to the flowers for the nectar (Wyatt and Shannon 1986) that is produced from secretory tissue at the base of the corolla next to the staminal column (Galil and Zeroni 1965, Christ and Schnepf 1985).

Studies by Agnew (1976), Willson and Bertin (1979), Pant *et al.* (1984), Morse and Fritz (1983), Willmer (1988) and Liede and Whitehead (1991) indicate that several pollinators may visit a given species, although some pollinators are more effective than others. In certain taxa, some degree of coevolution between the floral morphology and the pollinators is evident with certain pollinators having greater accessibility to nectar (Willmer 1988).

In Australia, over 90 species of Asclepiadaceae occur, yet the insect pollinators are unknown, apart from the record of *Metriorrhynchus lateralis* Redtenbacher (Coleoptera: Lycidae) pollinating *Marsdenia fraseri* Benth. (Forster 1989). The pollination of the introduced *Araujia sericifera* Brot. by a skipper butterfly was mentioned by Coleman (1935), but the species was not identified. Observations on the pollination of *Hoya australis* by *Ocybadistes walkeri sothis* at Indooroopilly, Queensland are presented in this paper. *H. australis* is a widespread and variable species in coastal northern and eastern Australia, Papuasia and Melanesia (Forster and Liddle 1991). Plants may be encountered in vineforests, vinethickets, rainforests and open eucalypt forest on rock outcrops, clifflines and mountain tops. The subspecies *H. a. australis* occurs in south-eastern Queensland and has flowers in clusters of 1-40 which are white in colour with red colouring at the base of the coronal lobes (Fig. 1). *O. w. sothis* is widely distributed in south-eastern Australia with the larva recorded as feeding on *Cynodon dactylon* (Poaceae)

and an unidentified *Dianella* (Phormiaceae) (Common and Waterhouse 1981), however, other aspects of its biology are unknown.

Materials and Methods

Field collected clones of *H. australis* were established at Indooroopilly, Brisbane, 6 km due east of the nearest known natural population at Mt Elphinstone, Kenmore. Flowering plants were observed during the daytime. When successful pollination of flowers had occurred, the flower from the corolla upwards abscised leaving the developing ovaries and sepals (Fig. 1B). Unpollinated flowers abscised at the junction of the pedicel and peduncle. Ninety-four abscised flowers were collected and the number of pollinaria removed and inserted in each flower counted. Individuals of *O. w. sothis* were collected and the positions of attached pollinaria noted. No other species were observed to visit the flowers.

Results

On anthesis the flowers of *H. australis* emit a strong sweet-smelling perfume, the intensity of which increases at dusk and persists throughout the evening. During March - May 1987, various individuals of *O. w. sothis* were observed visiting the flowers of different clones. Two individuals were also found trapped by the proboscis in flowers of *Araujia sericifera* Brot. Individuals of *O. w. sothis* were observed to feed on nectar during the day and in moving around individual flowers, removal and insertion of pollinaria was usually effected. Pollinaria lodged on either the front pair of legs or the proboscis. Butterflies were seen to attempt to dislodge pollinaria on the proboscis by rubbing with the forelegs, but not those on the forelegs.

Of the 94 abscised flowers collected (i.e. all with 1 or more pollinaria inserted), some 85 (90.4%) had 1 or more pollinaria removed. Given that each flower has five pollinaria available for removal and five positions for pollinarium insertion, from the 94 flowers, 470 pollinaria were available for removal and 470 positions were available for insertion. 232 (48.5%) pollinaria were removed and 163 (34.7%) inserted, thus the percentage efficiency of pollination (pollinaria inserted/pollinaria removed) was 70%.

Discussion

The pollination biology of some Asclepiadaceae, notably of American *Asclepias* species has been extensively studied by Morse and Fritz (1983), Wyatt (1976, 1982), Wyatt and Shannon (1986). Observations on other genera are few (e.g. Agnew 1976, Pant *et al.* 1982, Willmer 1988, Liede and Whitehead 1991) and those presented here are the first for the genus *Hoya* except for the brief observations of Brown (1885). The efficiency of pollination reported here is comparable to various *Asclepias* spp. pollinated primarily by Hymenoptera under natural conditions (e.g. Morse and Fritz 1983: 59-78%) and is higher than that obtained by Wyatt and Shannon (1986) for *Asclepias exaltata* (36-43%). The flowers of *H. australis* noticeably

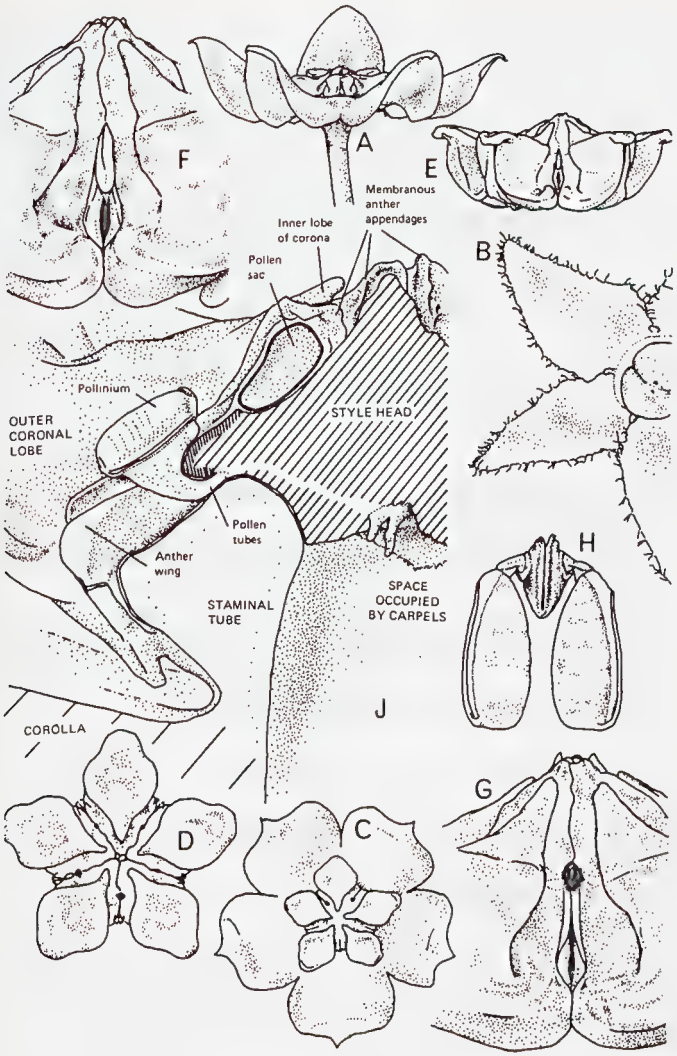

Fig. 1. Morphological aspects of pollination in *H. australis*. (A). side view of flower, x 2.5. (B). face view of calyx with corolla removed showing ovaries, x 10. (C). face view of flower, x 2. (D). face view of gynostegium, x 10. (E). side view of gynostegium, x 10. (F). side view of staminal column showing anther wings with inserted pollinarium, x 20. (G). side view of staminal column showing anther wings before pollinarium insertion, x 20. (H). pollinarium, x 30. (J). cross-section of gynostegium showing inserted pollinarium with pollen tube growth into the carpels, x 25. Del. K. Harold.

increase perfume production on dusk, which may indicate that nocturnal insects also play a role in pollination. A similar temporal variation of perfume emittance in *H. carnosa* (L.f.) R. Br. is due to an endogenous circadian rhythm (Altenburger and Matile 1988). Nocturnal pollinators are responsible for significant levels of pollination in *Asclepias* species (Morse and Fritz 1983, Jennersten and Morse 1991), and the pollination efficiency recorded for *H. australis* may be only partially due to the day flying *O. w. sothis*. The entrapment of several *O. w. sothis* in flowers of *Araujia* in close proximity to the flowering *Hoya* provides a demonstration that the flowers of these two distantly related taxa attract the same species. Whereas the attraction cues are similar for the two asclepiads, *O. w. sothis* is only able to use nectar from *H. australis* without becoming entrapped.

Acknowledgements
Mr K. Harold provided the drawings of *H. australis*. Miss M.A. Schneider identified the butterfly.

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